

FO-2

Committee on Optical Communications Systems



Felix P. Kapron

*Chair, FO-2
Principal Engineer,
BELLCORE*

FO-2's charter is to develop physical-layer optical fiber system test procedures (OFSTPs) and system design guides and specifications to assist suppliers and users of fiber optic communications technology. The Committee's emphasis is primarily on the arrangement of components into a fiber optic link, rather than on the individual components themselves. The OFSTPs

provide a standard way to measure system parameters so that results obtained by suppliers and users will agree with each other. Interoperability and multivendor compatibility are also important concerns of FO-2.

FO-2's six subcommittees address single-mode digital and analog systems, optically amplified systems with Wavelength-Division-Multiplexing (WDM), multimode fiber and multimode systems (primarily point-to-point local-area network applications). Other work includes optical system terms, definitions and symbols, optical cable placement, and system and active component reliability.

1995 Activities

Published in the past year, FO-2 has developed a guideline document which addresses Multimode Fiber Optic Link Transmission Design, TIA/EIA 620.

Work was begun in 1995 to extend EIA/TIA-559, the single-mode document, to include longer wavelengths, higher bit-rates, optical amplifiers, and WDM. Review work was also started on EIA/TIA-590, "Standard for Physical Location and Protection of Below-Ground Fiber Optic Cable Plant." In the area of active component reliability, TIA/EIA-610, "Procedures for Calculating Optoelectronic Device Reliability," was made ready for rebalotting.

Additional work includes studying OFSTPs for digital or analog systems which cover measurement of optical transmitter output power and installed cable loss. Digital test procedures address receiver sensitivity, electronic and optical jitter, reflections along the link, optical eye pattern, bit-error ratio, and single-mode dispersion power penalty. OFSTP-4, "Optical Eye Pattern Procedure," was published in 1995.

Analog test procedures, which in the coming year will complete balloting for publication, cover receiver sensitivity, Carrier-to-Noise Ratio (CNR), composite second-order distortion, composite triple-beat noise and cross modulation.

SUBCOMMITTEES:

FO-2.1/6.6 Joint Subcommittee on Single-Mode Systems

Chair: Allen Cherin, AT&T

FO-2.2 Subcommittee on Local Area Networks

Chair: Jim Kevern, AMP Incorporated

FO-2.2/6.6 Joint Subcommittee on LAN Component Characterization

Chair: Paul Reitz, AMP Incorporated

FO-2.4 Subcommittee on Optical Terms, Definitions, Document Control, and Safety

Chair: Joyce Kilmer, OPTOTEC

FO-2.5 Subcommittee on Outside Fiber Cable Plant

Chair: Paul Deraney, BELLCORE

FO-2.6/6.10 Joint Subcommittee on Reliability of Fiber Optic Systems and Active Optical Components

Chair: Hakan Yuce, BELLCORE

In 1995, FO-2 also continued to seek alliances with related industry associations as the convergence of technology remained a major focal point. Test procedures concerning the reliability of active components, system-level temperature cycle endurance tests, and the modal properties of light entering or leaving multimode components were among the areas of FO-2's interest. Updating glossaries on fiber optic terminology and graphic symbols were also on the Committee's agenda for the year.

FO-2 also maintains liaison with Subcommittee T1X1.5 on general test procedures and on optical amplifier operations, administration and maintenance.

In the international arena, close contact is maintained with international standards bodies. One is the International Electrotechnical Commission (IEC) Technical Committee 86 Fibre Optics, Subcommittee 86C Fibre Optic Systems, Working Group 1 on Fibre Optic Systems and Subsystems, and Working Group 3 on Optically Amplified Systems. Another is the International Telecommunication Union - Telecommunication Standardization Sector (ITU-T) Study Group 15 on Transmission Systems and Equipment, and its Working Party 4 on Optical Transmission.

In this capacity, TIA documents, such as FO-2's work on single-mode and multimode system design guidelines, are reworked and forwarded as U.S. contributions to the international bodies. FO-2 made two such document submissions to the ITU. In 1995, there was growing interest in optically amplified subsystems, some incorporating wavelength-division multiplexing in which FO-2 serves as a body for U.S. review. The Committee is also adapting international work on extended single-mode systems and analog transmission into TIA documents.

In 1996, in addition to continuing projects in progress, FO-2 will address:

- Revision of the installed cable plan standard to include protective measures to reduce the probability of cable damage;
- Polarization-mode dispersion which can limit the bandwidth of long optically-amplified systems;

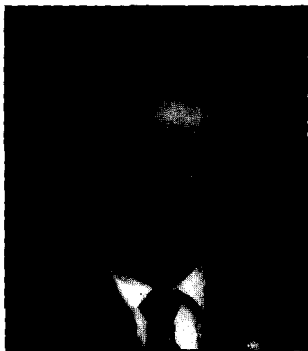
- Dispersion compensation that enables conventional 1310-nm fiber to be used in 1550-nm optically-amplified systems at long lengths;
- Accelerated measurement of bit-error ratios to determine values below 10⁻¹⁵ in short periods of time;
- Power-based measurement of optical extinction ratio, a new direct and accurate method;
- Measurement of fiber optic link optical return loss, particularly critical to analog or high-bit-rate systems;
- CNR of optically amplified systems;
- Gain and noise of optically-amplified WDM subsystems.

In 1996, the continuing thrust of FO-2 will be to produce new system design guidelines and system test procedures which reflect industry needs in the continuing advances of fiber optic communications technology. ■



FO-6

Fiber Optics



Edward F. Mikoski, Jr.

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Manager, Global Fiber Optic
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AMP Incorporated*

FO-6 is responsible for developing standards for the components of fiber optics systems, including fibers, cables, splices, sensors, waveguides, connectors, optoelectronic sources and detectors, assembly tooling, and tools for maintenance. The FO-6 Committee also undertakes the standardization of test methods, terminology and symbology, and issues relating to quality

assessment, reliability and intermateability. Since FO-6 uses the American National Standards Institute (ANSI)-accredited TIA standards development process for nearly all of its projects, the final publications are recognized as American National Standards. FO-6 is also a strong supporter of global standardization activities.

Since its inception, FO-6 has worked closely with the U.S. Department of Defense (DoD) in creating Fiber Optic Test Procedures (FOTPs). The DoD has consequently adopted many of these procedures along with documents addressing fiber optic terminology, graphic symbols, and fiber optic connector intermateability.

Additional work of FO-6 involves developing liaisons with system standardization efforts to contribute its component expertise as new areas begin to employ photons.

1995 Activities

FOTPs, compiled as the TIA/EIA 455 series of publications, were a major product of the Committee's work in 1995. Nearly 175 standards projects are in various stages of completion and more than 112 standards have been published as American National Standards.

In 1995, the FO-6.3 Subcommittee worked on Fiber Optic Connector Intermateability Standards

(FOCIS), published in the TIA/EIA 604 series, which are a new approach to identify critical dimensions required for standardizing mating interfaces used by connectors and other components requiring connection to a system. Each standard contains the requirements that define the interface between the mating elements for a particular connector type. The standards may be applied to connections to optical devices as well as to fiber-to-fiber connections. These standards are one element in the overall connector specification system.

SUBCOMMITTEES:

FO-6.1 Fiber Optic Field Tooling & Instrumentation

Chair: Arthur Riedlinger, AT&T Network Systems

FO-6.2 Terminology, Definitions & Symbology

Chair: Edwin Sakaguchi, Structural Technologies Associates

FO-6.3 Interconnecting Devices

Chair: Tom Ball, AMP Incorporated

FO-6.5 Opto-Electronic Sources & Detectors

Chair: Cliff Carlson, NRD - San Diego

FO-6.6 Fibers and Materials

Chair: Roy Lovv, Corning Incorporated

FO-6.7 Cables

*Chairs: Eric Loyty, Siesor Corporation
Mike Kinard, AT&T*

FO-6.8 Specification Structure & Processing

Chair: Steven Swanson, Corning Incorporated

FO-6.9 Fiber Optic Sensors

Chair: John Wahl, Corning Incorporated

FO-2.6/6.10 Reliability of Fiber Optic Systems and Active Optical Components

Chair: Hakan Yuce, BELLCORE

FO-6 addressed specifications covering most types of fiber optic components, as well as Fiber Optic Terminology as contained in the ANSI-recognized EIA 440 document. Members also focused on "Fiber Optic Graphic Symbols," EIA/TIA-587, the joint work of the FO-6 and FO-2 Committees. FO-6 participated in round-robin testing, often conducted in close concert with the U.S. National Institute of Standards and Technology (NIST), to evaluate new methods of measurement. A recent example is the international round-robin on fiber geometry being driven by FO-6.6.

Internationally, FO-6 contributes to the U.S. Department of State's U.S. National Committee Study Group C, a participant in the International Telecommunication Union's Telecommunications Standardization Sector (ITU-T) Study Group 15 Working Party 4. Additionally, contributions to international standards activities through the U.S. Technical Advisors to the IEC SC86A and SC86B and active member participation on international working groups have resulted in remarkably close harmony with documents produced within and outside the European Region. FO-6 made a total of 15 contributions to international standards organizations.

In 1996 and beyond, FO-6 plans to strengthen the material contribution to the development of international standards and technology. Work on standards' harmonization development with international and regional standardization bodies to aid in the minimization of potential trade barriers remains a priority for the Committee in the ensuing years. In keeping with this goal, FO-6 plans to increase the number and quality of liaisons with other standards development organizations to assist in preparing fiber optic component standards for specific system application requirements.

FO-6 will also continue to study component reliability, especially the significant advancements in fiber. The reliability of passive components such as connectors will remain a key focus of the Committee's work.

As well, FO-6 will focus its attention on expanding the standardization of fiber optic technology to address the needs of National and Global Information Infrastruc-

tures (NII/GII) as once clear boundaries between telecommunications, data communications and multimedia applications begin to blur.

Committee activities anticipated in 1996 include:

- Pursue recognition as the U.S. coordination point for IEC Calibration Documents through the Metrology group, under Subcommittee FO-6.1;
- Standardize and enter EIA 440 Fiber Optic Sensor terms;
- Study reliability of adhesives in ferrules;
- Create standards for Angled End-Face connectors and array-type connectors;
- Publish the first several of a new series of FOCIS documents;
- Create standards for isolators;
- Work closely with DoD to create industry standards for transmitters and receivers;
- Engage in new standardization projects for plastic fiber;
- Develop, with the National Institute of Standards and Technology (NIST), Standardized Reference Materials (SRMs) for chromatic dispersion and Polarization Mode Dispersion (PMD). International round robins have already been conducted on fiber geometry, coatings, ferrule geometry, and pin gauges.



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**List determined based on TIA database as of December 1995. Subject to change.*



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Building Industry Consulting Services International (BICSI)
Canadian Standards Association (CSA)
Cellular Telecommunications Industry Association (CTIA)
Electro Federation of Canada (EFC)
Multimedia Telecommunications Association (MMTA)
National Electrical Manufacturers Association (NEMA)
Solar Energy Industry Association (SEIA)
United States Telephone Association (USTA)



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AT&T

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Ericsson, Inc.

Global Engineering Documents

Motorola

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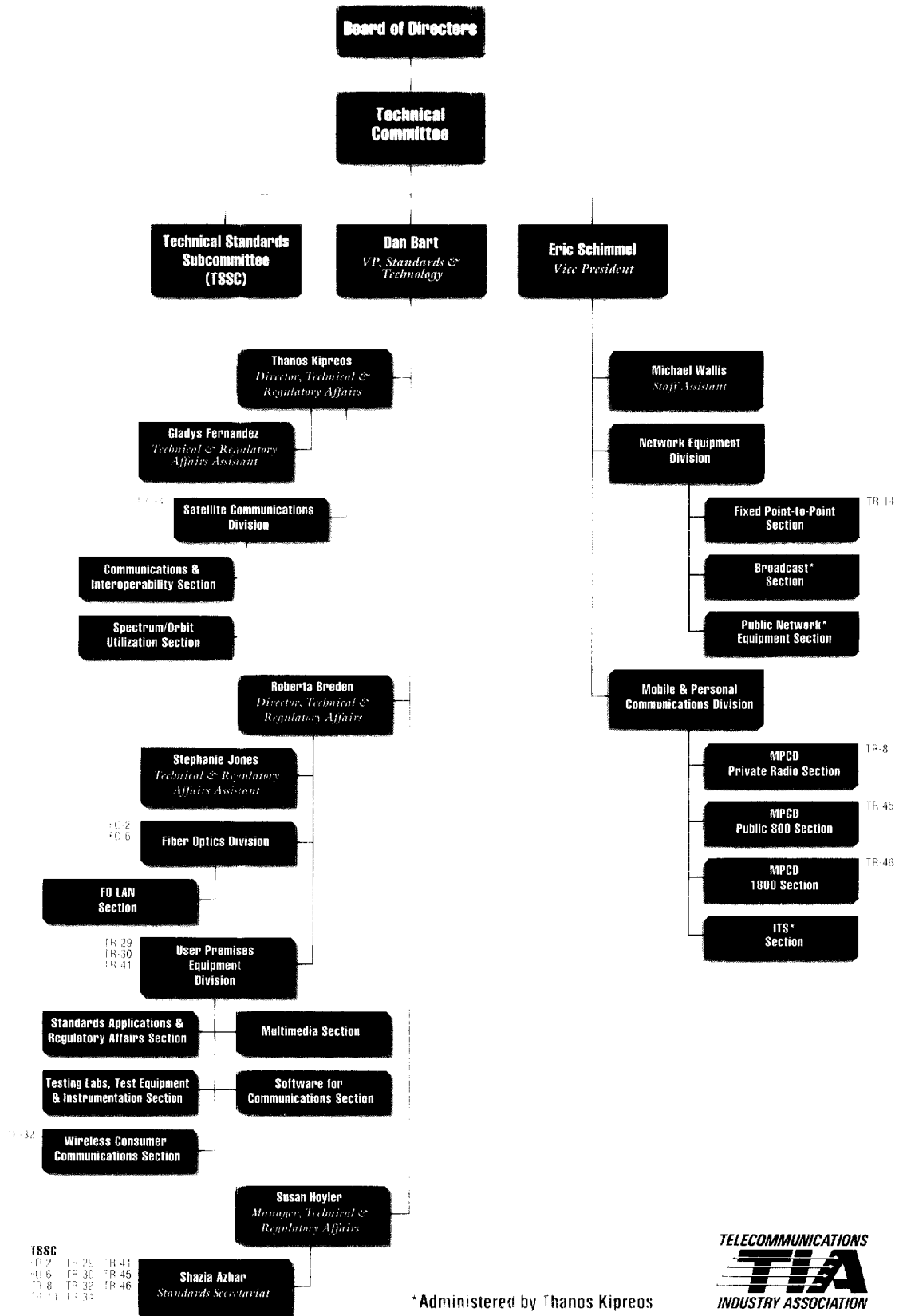
STANDARDS AND TECHNOLOGY DEPARTMENT



Seated from left to right, Eric Schimmel, Vice President; Thanos Kipreos, Director of Technical & Regulatory Affairs; Roberta Breeden, Director of Technical & Regulatory Affairs; and Dan Bart, EIA/TIA Vice President, Standards & Technology. Standing, from left to right, Gladys Fernandez, Technical & Regulatory Affairs Assistant; Michael Wallis, Staff Assistant; Stephanie Jones, Technical & Regulatory Affairs Assistant; Susan Hoyer, Manager, Technical & Regulatory Affairs; and Shazia Azhar, Standards Secretariat.

ORGANIZATIONAL STRUCTURE

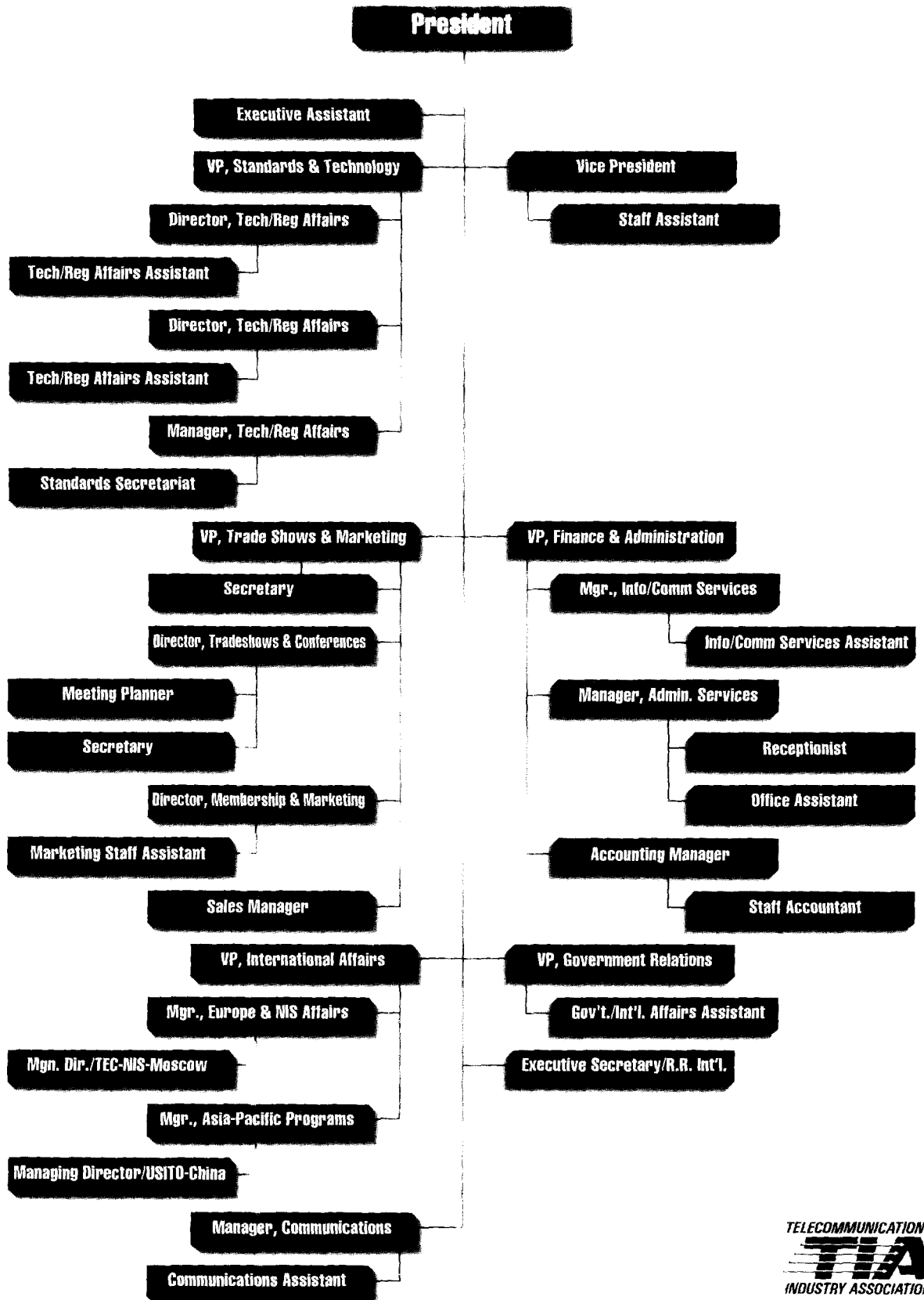
TIA Standards and Engineering Committees

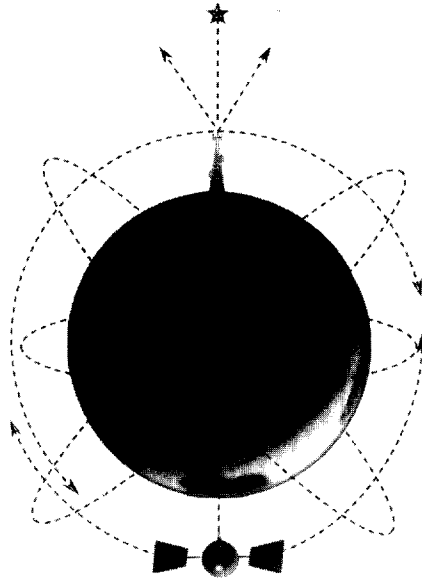


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